# ANNUAL REPORT FOR 2002

Deer Creek Mitigation Site
Carteret County
Project No. 6.16901T
TIP No. R-2105 WM

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North Carolina Department of Transportation
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## SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Deer Creek Mitigation Site. Located in Carteret County, the Deer Creek site serves as mitigation for impacts associated with the widening of NC 24. The site was originally designed to serve as integration between an onsite stormwater detention facility and the surrounding environment. The site was constructed and planted in spring 2001; however, initial vegetation failure led to a replanting of the site in the spring of 2002. Monitoring activities in 2002 represent the second year of hydrologic monitoring and the first year restart of vegetation monitoring.

The site must be monitored for five years following site construction or until success criteria are met. Monitoring criteria includes the percent cover of planted herbaceous vegetation and the hydrologic conditions at the site. The site is monitored with thirty vegetation plots, three surface water gauges, and one rain gauge. Data analysis includes an examination of all site recorded site data as well as an assessment of local climate conditions throughout the growing season.

Hydrologic monitoring was conducted for a second year. The three surface water monitoring gauges on the site show consistent inundation throughout the growing season, the water level does not drop below the ground surface for the entire monitoring period. An examination of the water levels over two days does show that the site floods twice a day in average climatic conditions (as determined by analysis of local rainfall data).

Vegetation monitoring was unsuccessful in 2001 due to low frequency in the target species and vegetative cover. Thus the site was replanted in spring 2002. In August 2002, monitoring revealed higher vegetation success; the frequency of target species was 100%, and the vegetative coverage scale value was calculated at 3.17. Thus the vegetation data for 2002 met the 70% required frequency of target species and is on track to meet the scale value of 5 for the vegetative coverage that is required in year five.

Elevation shots were taken in the summer of 2002 to determine if the emergency spillway on the detention basin was built according to the permitted plans. Discrepancies were found between the elevation of the spillway and the elevation of the riser pipe in the detention basin. The elevation of the spillway was raised to match the elevation of the riser pipe, as originally permitted. This work was done in late 2002. This work occurred in non-jurisdictional areas and was described in a letter addressed to the resource agencies on November 25, 2002.

NCDOT recommends that both hydrologic and vegetation monitoring continue in 2003.

# INTRODUCTION

## 1.1 Project Description

The Deer Creek Mitigation Site is located in Carteret County on the north side of NC 24 at the northeast quadrant of the crossing of Deer Creek. The mitigation site is approximately 4.25 ac in size. Approximately 1.5 ac of the site had previously been allocated as a stormwater detention facility designed for the NCDOT to treat runoff associated with the improvements associated with the widening of NC 24 (TIP No. R-2405AB). The existing Section 404 permit for widening NC 24 involves a commitment by NCDOT to better integrate the original 1.5 ac stormwater detention basin into the existing natural environment. To accommodate this, the NCDOT purchased the remaining 2.75 ac of land with the intent to utilize the area to provide compensatory mitigation for impacts to Section 404 wetlands associated with this TIP project.

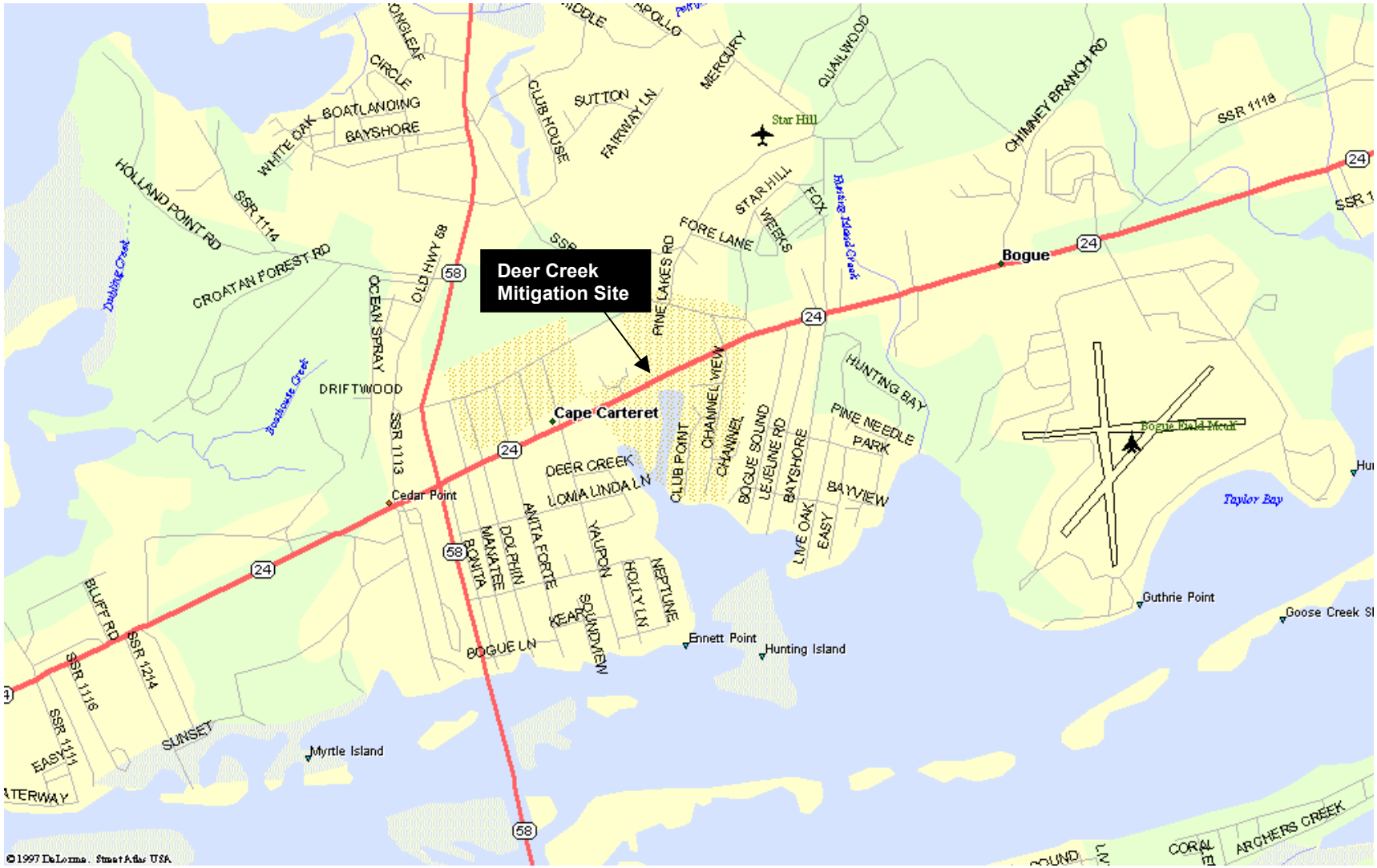
## 1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted. Vegetation will be monitored for five years following the completion of planting, and vegetative marsh success is determined in accordance with NMFS guidelines. The site will be considered hydrologically successful when the hydrologic data shows that the site is flooded twice daily. The following report details the results of hydrologic and vegetative monitoring during 2002 at the Deer Creek Mitigation Site.

## 1.3 Project History

| | |
|---|---|
| March 2001 | Construction completed |
| May 2001 | Site Planted |
| June 2001 | Gauges Installed |
| June –November 2001 | Hydrologic Monitoring (1 yr.) |
| August 2001 | Vegetation Monitoring (1 yr.) |
| April 2002 | Site Tilled and Replanted |
| February – November 2002 | Hydrologic Monitoring (2 yr.) |
| August 2002 | Vegetation Monitoring (Restart 1 yr.) |
| December 2002 | Spillway Modifications |

**Figure 1.** Site Location Map



# 2.0 HYDROLOGY

## 2.1 Success Criteria

The success of this site is correlated to the planting elevations and to planting success. If the plantings are successful, then the grading will have been correctly correlated to the tidal fluctuations. The hydrologic monitoring aspect will involve the use of surface water monitoring gauges. Groundwater monitoring is not required at this site because it is a tidal system. The site will be considered hydrologically successful when the site is flooded twice daily. Success is determined from data taken at the Gauge 1 location (SG-1), as the other gauges are located within channels and are used for comparison of tidal elevations. It is expected that the surface water flooding will be the same as that measured for the biological benchmarks for *Spartina alterniflora*, since the grading was done to an elevation that is known to be periodically flooded. Table 1 describes each gauge and the hydrologic expectations of each. See Figure 2 for precise location of each gauge.

**Table 1.** Gauge Description and Expectations

| Gauge | Elevation | Location | Hydrologic Expectation |
|---|---|---|---|
| SG-1 | 1.20 ft | low marsh between channel and high marsh | Flood twice daily |
| SG-2 | -0.64 ft | within constructed channel of site | Remain flooded, daily fluctuations |
| SG-3 | -0.54 ft | in Deer Creek adjacent to site | Remain flooded, daily fluctuations |

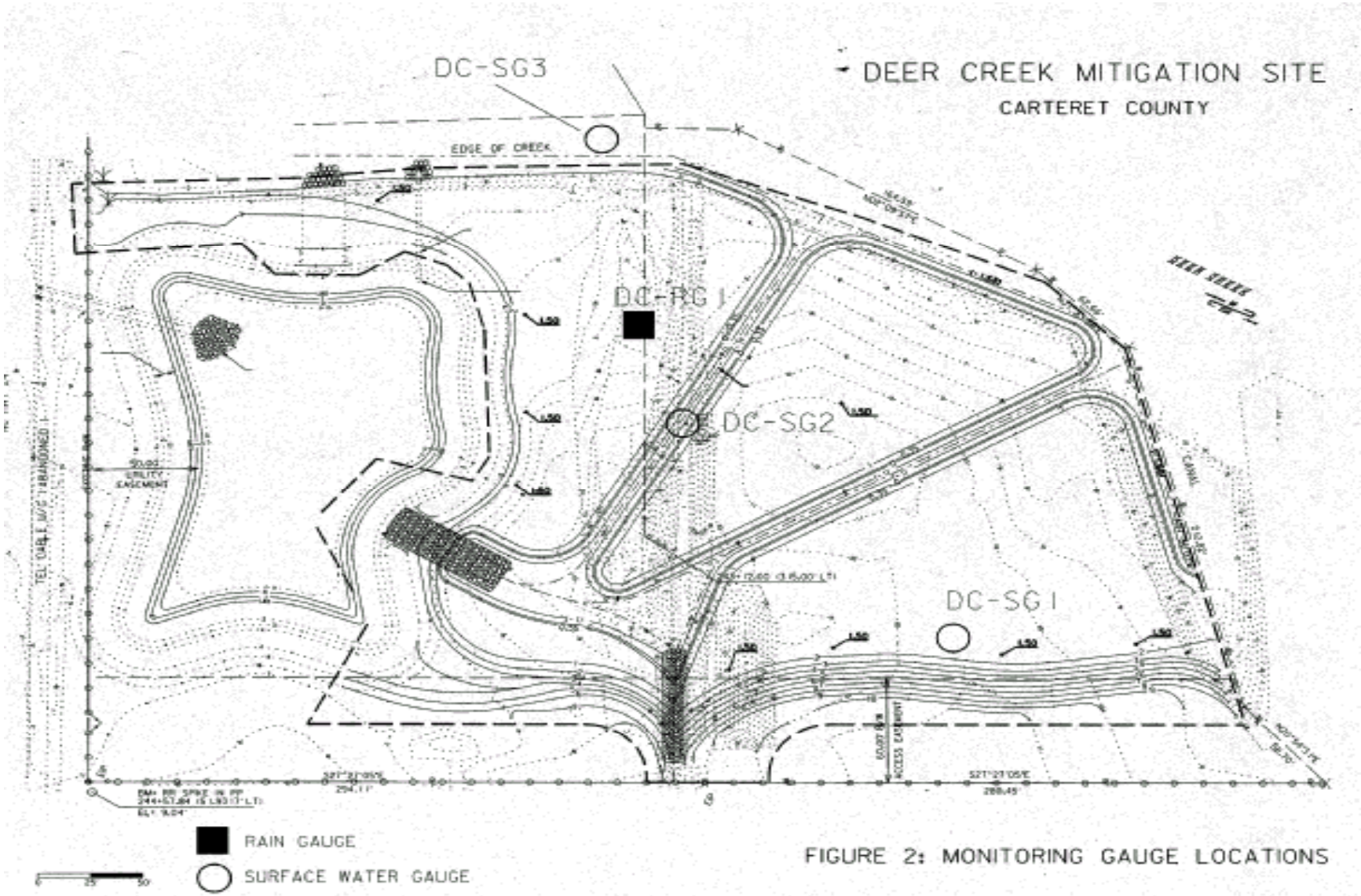
The site will be monitored during the growing season. The growing season in Carteret County begins February 27 and ends November 29 and is 274 days long. The dates correspond to a 50% probability that temperatures will drop to 28$^{o}$ F or lower after February 27 and before November 29.

## 2.2 Hydrologic Description

Three surface water monitoring gauges and one rain gauge were installed on site in June 2001 (Figure 2). The surface water gauges record surface water readings every hour. The Infinities rain gauge records rainfall amounts on a daily basis.

Appendix A contains two plots of the data at each surface gauge location. The first set of data plots shows the depth of surface water recorded by each gauge. The second set of plots shows the surface water recorded against the actual gauge elevation surveyed relative to mean sea level. Precipitation events are included on each graph as bars. The rainfall plotted was obtained from the onsite rain gauge. Also included in Appendix A is a plot of two days of surface water data recorded at the Gauge 1 location; this plot is to illustrate the twice daily flooding required in the permit conditions. The two days in the plot were chosen at random.

**Figure 2.** Gauge Location Map



## 2.3 Results of Hydrologic Monitoring

### *2.3.1 Site Data*

Gauge 1 was evaluated to determine if the site was being flooded twice daily. Tide data from Gauges 2 and 3 were evaluated for comparison. Gauge 1 data shows that area around the gauge was inundated the entire growing season, with normal fluctuations associated with the tides indicated. The water level never dropped below the ground elevation of 1.2 ft.

Because the site is so small, high tide elevations should be consistent between the three gauges. Gauge 1 shows that the water was fluctuating between elevations of 1.3 ft and 2.5 ft (extremes excluded). Gauges 2 and 3 showed maximum water elevations that are consistent with those recorded by gauge 1. While both gauges 2 and 3 showed lower extreme elevations than gauge 1, these were consistent with the lower elevations at which these gauges are located. Appendix A shows both the true elevation plots for all three gauges, as well as an individual graph of gauge 1 data that shows a two-day sample; this graph demonstrates the twice daily heightened water levels common throughout the growing season.

### *2.3.2 Climatic Data*

Figure 3 is a comparison of 2001 and 2002 monthly rainfall to historical precipitation for the area. The two lines represent the $30^{th}$ and $70^{th}$ percentiles of monthly precipitation for Morehead City, NC. These percentiles represent monthly rainfall data collected between 1948 and 2002. Because of data availability, the 2002 rainfall encompasses only precipitation through July 2002. The 2003 annual report will include a 30-70 percentile graph with the monthly rainfall from August through December of 2002. The NC State Climate Office provided all historical and current monthly rainfall data for Morehead City.

Of the nine months of available data since November 2001, only March 2002 showed slightly higher than normal rainfall levels. Five additional months yielded average rainfall totals, while the remaining three months showed below average rainfall. Overall, the site met hydrologic criteria in a year of average climate conditions; however, rainfall is not the primary hydrologic influence for the site.

## 2.4 Conclusions

The data for surface Gauge 1 indicates that for most of the growing season, the site is flooded on a twice daily basis, as is required. The water level never went below the ground surface at the Gauge 1 location. The surface water elevations are comparable with the other two site gauges. Though rainfall is not a primary hydrologic influence, the site experienced average climatic conditions.

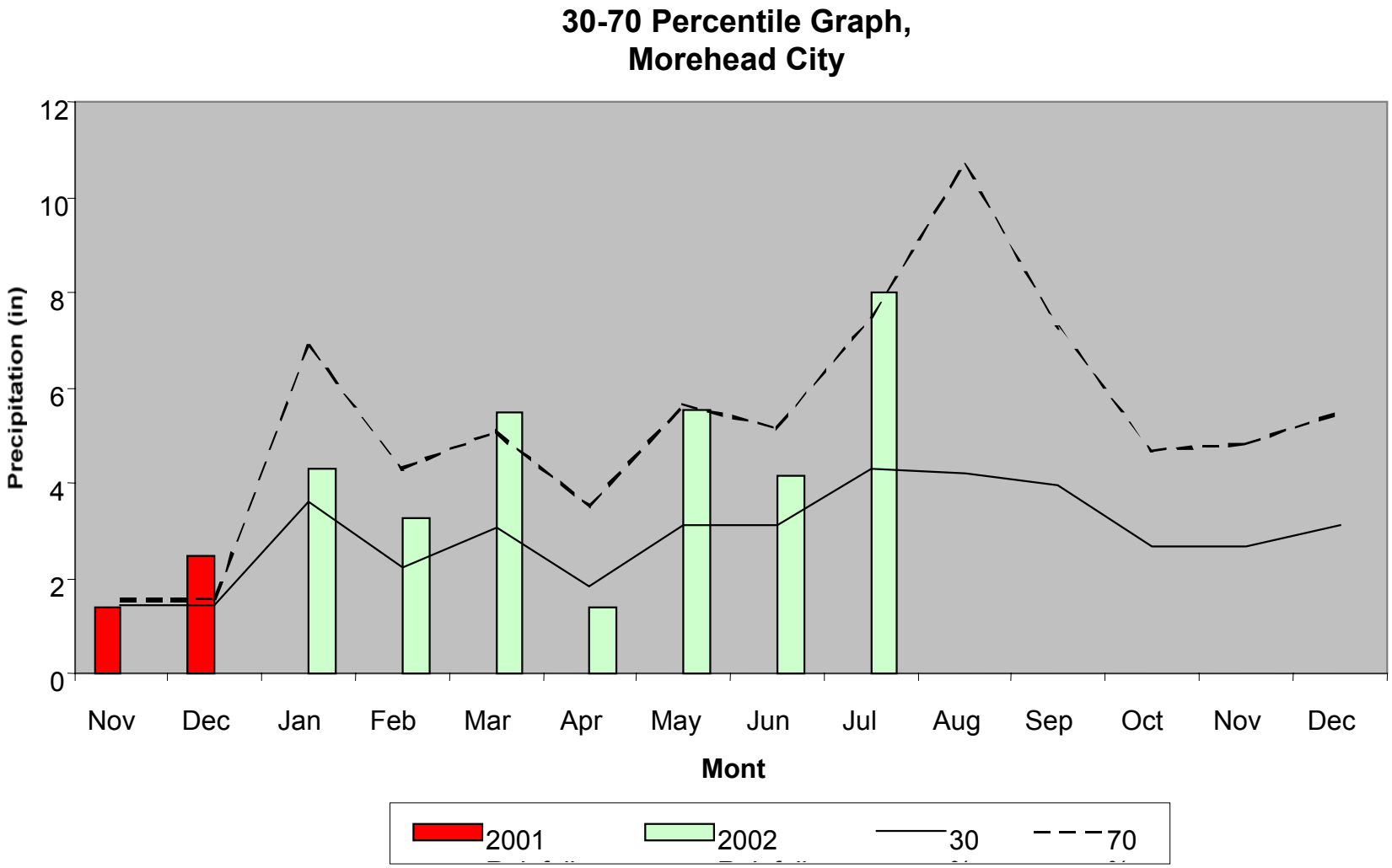



**Figure 3**. 30-70 Percentile Graph

# 3.0 VEGETATION

## 3.1 Success Criteria

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. Monitoring plots found to be located within the open water channel will not be evaluated, and will not count toward the final count of plots. The vegetation component of the wetland site will be deemed successful if the following criteria are met.

1. At year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.
2. A minimum of 70% of the plots shall contain the target (planted) species.

## 3.2 Description of Species

The following marsh grass species were planted in the Wetland Restoration Area:

*Spartina patens*, Saltmeadow Cordgrass
*Spartina alterniflora*, Smooth Cordgrass

## 3.2 Results of Vegetation Monitoring

**Table 2.** Vegetation Monitoring Results

| Plot # | Scale Factor | *Spartina patens* | *Spartina alterniflora* | Frequency | Comments |
|---|---|---|---|---|---|
| 1 | 0.0 | | | | open water |
| 2 | 0.0 | | | | open water |
| 3 | 3.0 | | ✓ | ✓ | |
| 4 | 0.0 | | | | open water |
| 5 | 2.0 | | ✓ | ✓ | |
| 6 | 3.0 | | ✓ | ✓ | |
| 7 | 4.0 | | ✓ | ✓ | |
| 8 | 5.0 | | ✓ | ✓ | |
| 9 | 5.0 | | ✓ | ✓ | *Aster* sp. |
| 10 | 3.0 | ✓ | ✓ | ✓ | |
| 11 | 0.0 | | | | open water |
| 12 | 3.0 | | ✓ | ✓ | |
| 13 | 4.0 | | ✓ | ✓ | |
| 14 | 2.0 | | ✓ | ✓ | |
| 15 | 2.0 | | ✓ | ✓ | |
| 16 | 0.0 | | | | open water |
| 17 | 5.0 | | ✓ | ✓ | |
| 18 | 3.0 | ✓ | ✓ | ✓ | |
| 19 | 0.0 | | | | open water |
| 20 | 4.0 | | ✓ | ✓ | |
| 21 | 5.0 | | ✓ | ✓ | |
| 22 | 4.0 | | ✓ | ✓ | |
| 23 | 3.0 | ✓ | ✓ | ✓ | |
| 24 | 2.0 | | ✓ | ✓ | |
| 25 | 1.0 | | ✓ | ✓ | |
| 26 | 1.0 | | ✓ | ✓ | softstem bullrush, *Scirpus* sp. |
| 27 | 4.0 | | ✓ | ✓ | |
| 28 | 3.0 | | ✓ | ✓ | |
| 29 | 0.0 | | | | open water |
| 30 | 2.0 | | ✓ | ✓ | |
| | 73.0 | | | | |
| Frequency (Percentage of Plots with Desired Species) | | 13.0% | 100.0% | 100.0% | |
| Sum Scale Value | | | | 73 | |
| Total Number of Plots | | | | 23 | |
| Vegetative Cover (Scale Value) | | | | 3.17 | |
| | | | | | |

## 3.4 Conclusions

Percent Frequency of Target Species **100%** (Frequency of 70% required)

Vegetative Cover Percentage **3.17** (Scale Value of 5 required for year 5)

Site was tilled for compaction and replanted with 7,300 Smooth Cordgrass plants in April 2002. Vegetation onsite has improved greatly. Frequency and coverage are on track for year 1.

NCDOT will continue vegetation monitoring at the Deer Creek Mitigation Site.

# 4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

The site has been monitored for the first year following replanting activities in the spring of 2002. Hydrologic monitoring indicated that the site was consistently inundated, with surface water levels varying with the tides. Vegetation monitoring yielded a successful 100% frequency of target species and 3.17 vegetative coverage. Field observations have shown that the site is flooded.

Based upon these initial results, NCDOT recommends that both hydrologic and vegetation monitoring continue.

# APPENDIX A

# SURFACE WATER GAUGE GRAPHS

# APPENDIX B

# SITE PHOTOS

# Deer Creek

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

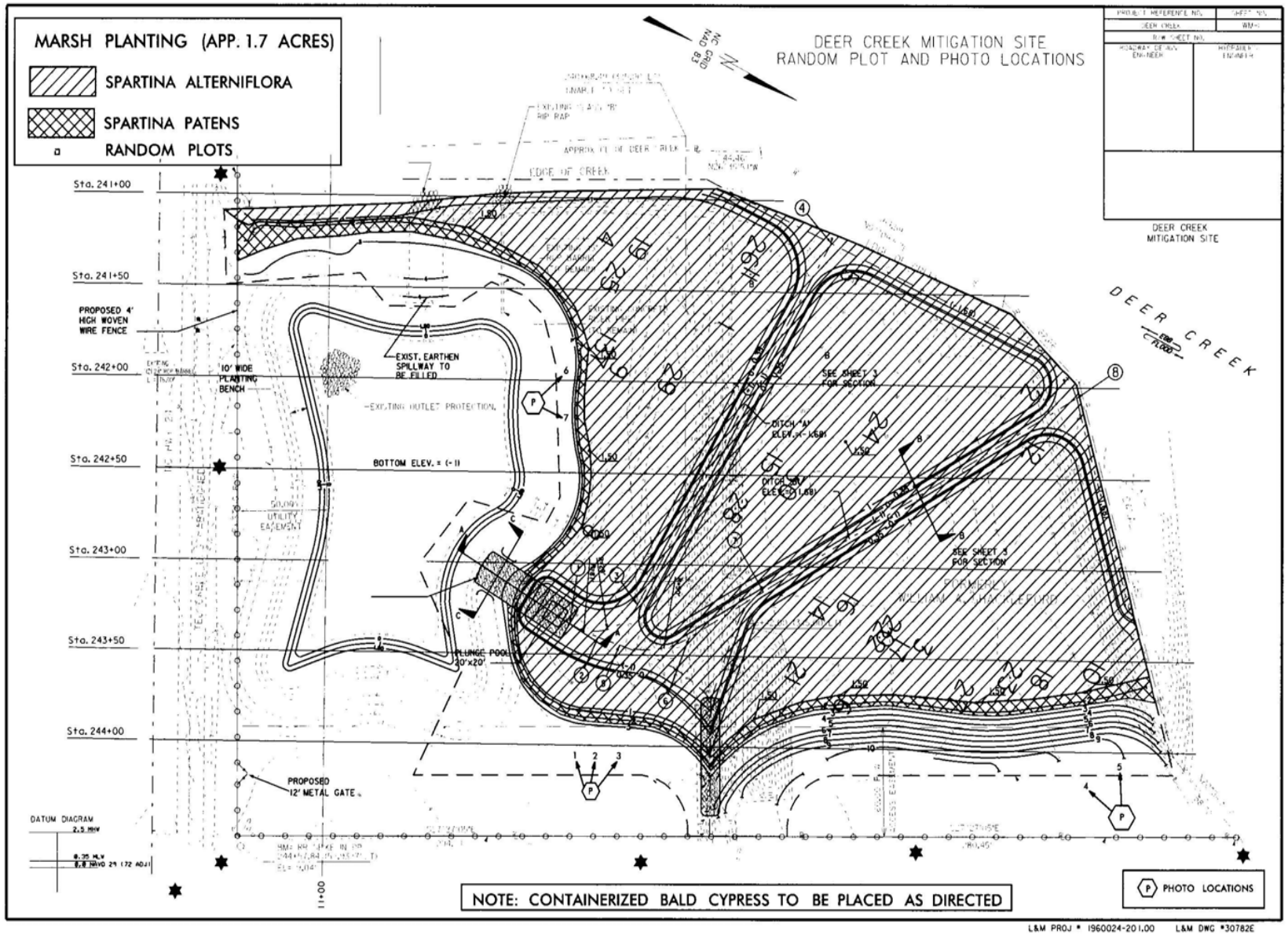
Photo 6

# Deer Creek

Photo 7

# APPENDIX C

# VEGETATION PLANTING PLAN


MARSH PLANTING (APP. 1.7 ACRES)
SPARTINA ALTERNIFLORA
SPARTINA PATENS
RANDOM PLOTS
DEER CREEK MITIGATION SITE
RANDOM PLOT AND PHOTO LOCATIONS
DEER CREEK
MITIGATION SITE
Sta. 241+00
Sta. 241+50
Sta. 242+00
Sta. 242+50
Sta. 243+00
Sta. 243+50
Sta. 244+00
PROPOSED 4' HIGH WOVEN WIRE FENCE
10' WIDE PLANTING BENCH
EXIST. EARTHEN SPILLWAY TO BE FILLED
EXISTING OUTLET PROTECTION
BOTTOM ELEV. = (-) 1
SEE SHEET 3 FOR SECTION
DITCH 'A'
DITCH 'B'
PLUNGE POOL 30'x20'
PROPOSED 12' METAL GATE
EDGE OF CREEK
DEER CREEK
DATUM DIAGRAM
2.5 MHW
0.35 MLW
0.0 NAVD 29 (72 ADJ)
NOTE: CONTAINERIZED BALD CYPRESS TO BE PLACED AS DIRECTED
PHOTO LOCATIONS
L&M PROJ # 1960024-201.00 L&M DWG #30782E